FACT SHEET

United States Environmental Protection Agency
Region 10
Park Place Building, 13th Floor
1200 Sixth Avenue, WD-134
Seattle, Washington 98101
(206) 553-1214

February 24, 1997

Permit No.: AK-005057-1

PROPOSED ISSUANCE OF A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE POLLUTANTS PURSUANT TO THE PROVISIONS OF THE CLEAN WATER ACT (CWA).

Coeur Alaska, Inc.
(Kensington Mine)

has applied for issuance of a NPDES permit to discharge pollutants pursuant to the provisions of the CWA. This fact sheet includes (a) the tentative determination of the Environmental Protection Agency (EPA) to issue the permit, (b) information on public comment, public hearing and appeal procedures, (c) the description of the proposed discharge, (d) a listing of tentative effluent limitations, schedules of compliance and other conditions, and (e) detailed descriptions and maps of the Project and discharge locations. We call your special attention to the technical material presented in the latter part of this document.

Persons wishing to comment on the tentative determinations contained in the proposed permit may do so by the expiration date of the Public Notice. All written comments should be submitted to EPA as described in the Public Comments Section of the attached Public Notice.

After the expiration date of the Public Notice, the Director, Office of Water, will make final determinations with respect to the permit issuance. The tentative determinations contained in the draft permit will become final conditions if no substantive comments are received during the Public Notice period.

If no substantive comments are received, the permit will become effective immediately. If comments are received, the permit will become effective 30 days after the final determinations are made, unless a request for an evidentiary hearing is submitted within 30 days after receipt of the final determinations.

The proposed NPDES permit and other related documents are on file and may be inspected at the above address any time between 8:30 a.m. and 4:00 p.m., Monday through Friday. Copies and other information may be requested by writing to EPA at the above address to the attention of the NPDES Permits Unit, or by calling (206) 553-1214. This material is also available from the EPA Alaska Operations Office, Room 537, Federal Bldg., 222 W. 7th Avenue, Suite 319, Anchorage, Alaska 99513, or EPA Alaska Operations Office, 3200 Hospital Drive, Suite 101, Juneau, Alaska 99801.

The complete planning record for the draft Supplemental Environmental Impact Statement (DSEIS), including all documents referenced in this fact sheet, is available at the Forest Service, Juneau Ranger District, 8465 Old Dairy Road, Juneau, AK 99801.

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I. Applicant

Coeur Alaska, Inc. (Kensington Mine)

Mailing Address:	Facility Location:
431 North Franklin Street	Approximately 50 miles north
Suite 400	of Juneau, in southeast Alaska
Juneau, AK 99801	in the Sherman Creek drainage basin.

Contact: Robert T. (Rick) Richins, Vice President
Environmental Services and Governmental Affairs

NPDES Permit No.: AK-005057-1

II. Activity

The Kensington Gold Project (Project) is a proposed underground gold mine located on the west side of the Kakuhan Range, adjacent to Lynn Canal, approximately 45 air miles north of Juneau, Alaska and 35 air miles south of Haines, Alaska (Figure 1) in the Sherman Creek drainage basin. The proposed facility arrangement for the Project is shown on Figure 2. The major components associated with the Project proposal include an underground mine, mill site, haul and access roads, dry tailings disposal facility, topsoil stockpiles, and borrow pits. Ancillary facilities include: generator facilities, an office and maintenance complex, an employee housing camp, a heliport, a marine terminal, an explosives magazine, stormwater diversion systems, and other minor facilities.

The mining activity will consist of underground mining of a mesothermal gold deposit. The mine life is estimated to be 12 years plus two years of construction (14 years total), with a production of approximately 4,000 tons of ore and 400 tons of underground development rock (waste rock) per day. Ore reserves are estimated to be approximately 20 million tons.

The mine will be accessed through the existing 850 level lower portal. Initial ore preparation by crushing will be performed underground and the ore conveyed to the process facilities. These facilities lie in a north-south orient adjacent to Sherman Creek and will be constructed by cut and fill methods.

Processing of the ore will consist of a flotation circuit producing a concentrate from the diorite host rock. The concentrate will contain the gold-bearing mineral calaverite ($AuTe_2$), native gold, pyrite, chalcopyrite and other minerals, principally silicate. The concentrate comprises approximately five percent ore by weight, and will be transported off-site for processing.

The flotation tailings will be dewatered and placed in a dry tailings facility (DTF). The proposed site for the DTF is on the east side of Lynn Canal between Sherman Creek and Sweeny Creek (Figure 2). The flotation tailings will be transported to the DTF site via a tailings slurry pipeline, where they will be dewatered to a moisture content suitable for handling with conventional earth moving equipment. The dewatered tailings will then be hauled a short distance by truck and placed into a series of cells within the landfill. Each lift of tailings will be covered with till borrowed from an area northwest of the process area. Development rock from the underground mine will be interlayered between till and tailings to enhance trafficability and long-term drainage of the tailings materials.

More detailed discussions of the individual Project elements are provided in the following section - Water Management.

Water Management

NPDES permits are required for all facilities that discharge wastewater into waters of the United States. The NPDES program is mandated by the Water Pollution Control Act of 1972 as amended by the Water Quality Control Act of 1987.
A detailed description of the proposed surface water management plan for the Project from construction to closure is presented in *Surface Water Management Plan, Kensington Mine Alaska* (SRK 1996a). Elements of this and other plans have been incorporated within this document.

Three process discharges and several stormwater discharges have been proposed for the Project. Outfall 001 will discharge from the process water sediment pond, which receives influent from the mine drainage treatment system and stormwater from the process areas. Outfall 002 will discharge from the DTF sediment pond, which receives flows from the DTF foundation, toe, lateral drains, and surface. Outfall 003 will discharge from the domestic wastewater treatment system at the beach area, which receives domestic sewage from the personnel camp. In addition to these process water discharge locations, stormwater will be discharged from selected locations within the Project. Outfalls 004 and 005 are stormwater outfalls. The following sections describe each of the outfalls in detail.

Mill Area Combined Discharge (Outfall 001)

A process area sediment pond will be constructed near the mill site (Figure 2). The system is designed as a single pond comprised of two internal cells to optimize sediment removal and management (SAIC, 1997a) . Stormwater runoff from the process area (e.g., mill and surrounding area), the sand and gravel borrow area, the development rock storage area, the till borrow access road, and the personnel camp, will be routed to the first cell through a riprap lined spillway. This spillway is designed to collect and route the runoff produced from up to the 100-year, 24-hour precipitation event. The pond is designed so that primary settling of sediments will occur in cell 1. Cell 1 is divided from cell 2 by a spillway that is notched in the center berm to provide flow between the two cells. Flows up to the 100-year, 24-hour event will route through the notch. The rate of flow from cell 1 to cell 2 through the notch will vary depending on the size of the runoff event and the current level of sediment stored in the cell. The sediment storage capacity of cell 1 is designed to hold the estimated average annual sediment yield for 5 years and periodic removal of sediments will likely be required. Sediment will be removed if sediment levels reach 2.5 feet below the level of the notch.

Cell 2 is designed to detain and route mine drainage and peak flows up to the 100-year, 24-hour storm event. The sediment storage capacity of cell 2 is designed to conservatively hold the estimated secondary removal of sediments for the life of the mine. If required, however, sediment removal would be conducted when sediment levels reach 2.5 feet below the bottom perforations of the decant pipe. Discharge from cell 2 to Outfall 001 will be through a perforated decant pipe which is designed to discharge peak flow from events up to the 10-year, 24-hour event. At events greater than the 10-year, 24 hour storm event, the pool elevation in the pond would exceed the height of the pipe and drainage would occur through the top of the pipe as well as through the perforations. A riprap lined spillway is designed to discharge peak flows from the 100-year, 24 hour storm event to Outfall 001 that are in excess of the discharge capacity of the decant pipe.

It is anticipated that the addition of flocculants may be necessary to meet discharge criteria for TSS for some storm events. Flow controlled flocculant addition will be installed at the pond inlet. A concrete or grouted riprap ditch section for flow mixing will be used to add flocculant and route it to the pond. The rate of flocculant addition for certain storm events is currently being quantified by feasibility tests being conducted by the applicant.

The volume of mine drainage that could be generated by development of the mine is difficult to predict. Coeur has proposed to utilize an estimated mine dewatering rate of 600 to 1,100 gpm to design the mine drainage treatment system. A study included in the NPDES permit application for the project indicates a potential peak flowrate of 3,800 gpm when the mine is fully developed near the end of the project life. Prior to the issueance of the final permit Coeur will be required to demonstrate that the capacity of the mine drainage treatment facility can be increased to handle the maximum anticipated mine drainage flow.

Treated mine water will be routed from the treatment system (see below) through a pipe and discharged into cell 2 of the pond. The flow rate from the pond to Outfall 001 will vary, depending on the volume of discharge from storm events and the quantity of discharge from the mine water treatment plant to cell 2. The minimum rate of discharge at Outfall 001 will equal that of the discharge from the mine drainage treatment plant. The discharge at this outfall will increase and decrease above this level as storm discharges are routed through the pond. The peak flow from this facility is estimated at 8,557 gpm for the 10-year, 24-hour storm event and 29,247 gpm for the 100-year, 24-hour storm event. These peak flows include the 3,800 gpm estimate to account for discharge from the mine drainage treatment plant.

Mine Drainage Treatment System

Dewatering of the mine workings will be necessary during mining operations. An engineered mine water management system will be used to collect and route excess water away from active operations. Below grade sumps will be used within the underground mine facilities. Mine water polymer pretreatment, in conjunction with the sump system will remove larger sediment and rock particles from the mine water. The decanted mine water will be pumped from the sump system at the active mine workings. A portion of the mine water will be utilized as makeup water for mill operations with excess water routed to the mine water treatment system. Exploration activities at the mine currently generate between 400 and 1,000 gpm that are discharged to an Ophir Creek tributary under a state wastewater permit. Water quality measurements indicate that mine water discharge quality is generally good, but that periodically, the discharge may exceed some of the applicable water quality criteria. During development and operation of the mine, mine water from discrete areas of the mine will be mixed; therefore, the mine discharge directed to the mine drainage treatment system is expected to be relatively uniform in chemical composition.

After evaluating numerous treatment scenarios, a chemical precipitation/filtration system was identified as the most appropriate metals removal process for the mine drainage effluent. A general description of the treatment system follows, however, a detailed description is presented in *Kensington Mine Project - Mine Drainage Treatment and Disposal* (Montgomery Watson, 1996a).

The chemical treatment process will consist of chemical addition, precipitation, flocculation, and settling. The chemical process will allow solids to accumulate in the clarified section of the floc tank which will be wasted from the system when the solids blanket becomes too deep to prevent floc carryover in the effluent. Waste solids from the floc tank (approximately 1,400 gpd at 750 gpm flow) will be added to those tailings that are backfilled into the mine. Effluent from the chemical process will flow through a filtration process consisting of a dual media filter with a self-backwashing feature with backwashing determined based on turbidity, time or headloss development, depending on the desired operational parameters. Filter backwash will be recycled to the initial chemical treatment tank. Chemical additions to the treatment system will include those listed in Table II-1.

TABLE II-1. Chemical Additions

Chemical	Function	Average Daily Use
Sodium Hydroxide or Lime	Chemical Precipitation	414 lbs/day
Polymer	Chemical Precipitation	9 lbs/day
Ferric Chloride	Chemical Precipitation	450-540 lbs/day
Polymer	Filtration	9 lbs/day

Sulfuric Acid	pH Adjustment	180 lbs/day

DTF Discharge (Outfall 002)

The proposed DTF site is shown in Figure 2. The proposed facility will be developed over part of a gently sloping area located east of Lynn Canal. The maximum footprint of the facility is estimated to be 113 acres, of which approximately 70 percent will be used for tailings disposal. Bedrock at the site is overlain by discontinuous layers of glacial till and organic mat varying in thickness up to 6 and 4 to 5 feet, respectively. Test pits in the area indicate a highly porous and saturated condition in the upper organic layers and a perched water table located in or at the bottom of the till layer. This shallow groundwater appears to represent the localized recharge and discharge of precipitation. A lower water table is also present within the bedrock.

The management of ground and surface water flows has been a major consideration in the development of the DTF. The flows from the DTF site include:

- Foundation drainage, pre-unit operation
- Development rock runoff
- Tailings seepage/drainage
- Coarse till drainage
- Reclaimed area runoff

Each of these flows is described in the sections below followed by an overall facility water balance. All drainage from the DTF, with the exception of diverted stormwater, will be directed to the DTF sedimentation pond. Discharges from the sedimentation pond will enter Unnamed Creek via Outfall 002. Detailed descriptions of the DTF are presented in *Dry Tailings Facility Preliminary Design Report, Kensington Gold Project, Alaska* (SRK 1996b), which was presented as Addendum 7 to the NPDES Application and Technical Support document and in *Geotechnical Resource Document for the Supplemental Environmental Impact Statement* (SAIC, 1997b*).*

Foundation Drain

A main stormwater diversion trench will be constructed prior to installation of the foundation drain. The main stormwater diversion will intercept and limit recharge to the foundation soils from the upland watershed to the east of the DTF. The trench will discharge stormwater into unnamed intermittent creeks which flow to the beach at Lynn Canal. Assuming free drainage, minimal up-gradient runoff or shallow groundwater would enter the foundation of the DTF area. Limited water may bypass the trench diversion and become lateral flow into the foundation. The diversion will be designed for the 100-year, 24-hour storm event during active operations. At closure, the capacity will be expanded to divert the 500-year, 24-hour event.

The DTF foundation drains will be constructed at least 18 months before initial tailings placement. This will be done to facilitate drainage of the underlying materials. The drains will be herringbone design and will use beach gravel and a filter blanket. The discharge will be considered a stormwater outfall prior to initial tailing placement. The stormwater discharge from construction-related activities will not be addressed by this permit. Instead, these discharges will be addressed by the requirements of EPA's Construction General Permit, under which Coeur will apply for coverage. During dry tailings placement operations, the drainage system will flow into the DTF settling pond. Under active operations, the drainage system would receive only seepage through the unit, i.e., tailings drainage. This is expected to be a very low flow (see below for a discussion of the overall DTF water balance).

Development Rock Runoff

A 24-inch layer of development rock will be placed over the foundation and foundation drainage system in advance of initial tailings deposition. The development rock drainage layer will act as a seepage collection system for the tailings drainage, and will be connected to the toe drain and sedimentation pond. The development rock layer will also act as a trafficking surface for haul trucks. Each 28-foot lift of tailings will be covered with 1 foot of fine till material as a hydraulic barrier with 10^{-7}(cm/sec) permeability. The fine till will be covered with 1 foot of waste rock material. The design of the DTF is intended to minimize wetting of the tailings. Therefore, only tailings in the active horizontal section of each lift will be exposed. Most of the exposed material will be waste rock. Runoff/drainage from the exposed lift will flow downgradient into the DTF settling pond. During the first 3-4 years of operation, primary waste rock storage will be in a pile at the mill site. Later, after the initial supply is exhausted, it is anticipated that the demand for waste rock in construction will roughly equal the supply. Therefore, waste rock storage at the DTF site will be minimal (i.e., small piles in future cells and/or reclaimed areas).

Tailings Drainage (rougher tails)

The dewatered tailings will be placed by truck onto the constructed development rock layer in 28-foot lifts. Maximum height of the facility will be 5 to 7 lifts, as noted above. Each tailings lift will be covered concurrently by a one foot layer of compacted low permeability till overlain by one foot of development rock. The compacted till layer will promote runoff and limit infiltration into the tailings. The development rock layer will act as a trafficking surface and a lateral drain for surface impounded on each lift. With the completion of several lifts, each having an underlying drainage and till layer, infiltration through the tailings mass will be limited, as shown in the water balance below.

Coarse Till Drainage

The completed areas of the DTF will be concurrently reclaimed and covered with two feet of fine low permeability till, six feet of coarse till and topsoil. Precipitation that infiltrates covered areas will drain through the coarse till. In the DTF site water balance, this flow has been characterized by "coarse till drainage."

Reclaimed Runoff

Concurrent reclamation will occur as the DTF is constructed. Precipitation which falls on reclaimed areas is an increasing flow in the DTF water balance as the amount of reclaimed area increases during the life of the mine. This runoff is assumed similar to the water quality of the intermittent creeks in the area (except for TSS).

DTF Sediment Pond

A sediment pond will be constructed to manage runoff and drainage from the DTF (Figure 2). The system is designed as a single pond composed of one cell. The pond will be designed to capture and manage stormwater runoff and drainage from the DTF. Sources include stormwater runoff from reclaimed areas and development rock, and drainage from tailings and coarse till. Flows will be routed to the pond through a riprap lined spillway designed to collect and route the runoff produced from up to the 100-year, 24-hour precipitation event.

Discharge from the pond to Outfall 002 will be through a perforated decant pipe which is designed to discharge peak flow from events up to the 100-year, 24-hour event, similar to the process area sediment pond. A riprap lined spillway is designed to route peak flows from the 100-year, 24-hour event to Outfall 002 that are in excess of the discharge capacity of the decant pipe. Similar to Outfall 001, it is anticipated that the addition of flocculants may be necessary to meet discharge criteria for TSS for some storm events.

The sediment storage capacity of the pond is designed to conservatively hold the estimated average annual sediment yield for 5 years plus the sediment yield which would occur from a 10-year, 24-hour storm. The periodic removal of sediments will likely be required. Sediments will be removed if sediment levels reach 2.5 feet below the bottom perforations of the decant pipe.

The pond design reflects the most conservative DTF construction for the 100-year, 24-hour event. The design configuration assumes tailings cells 1 and 2 fully reclaimed with cell 3 still receiving tailings.

DTF Water Balance

The flow rate from the pond to Outfall 002 will vary depending on the volume of discharge from storm events and the quantity of drainage from the DTF. The rate of discharge at Outfall 002 will equal that of the discharge from the combined runoff and drainage sources. In the absence of precipitation and runoff events, discharge at Outfall 002 will equal that of the DTF seepage rate. The discharge will increase and decrease above this level as storm discharges are routed through the pond. Table II-2 presents a quarterly and annual water balance for the DTF. The quarterly flow estimates provided were produced with the use of the Hydrologic Evaluation of Landfill Performance (HELP) model. The HELP model combines precipitation and other climatic input factors to predict runoff, infiltration, and 1-dimensional flux through modeled layers or lifts of an embankment or landfill. The values included are presented in *Revised Form 2D: Discharge Criteria for Dry Tailings Facility. NPDES Permit Application and Technical Support* (SRK 1996d).

TABLE II-2 DTF Water Balance Prediction

Contributing Source	Average Quarterly Flows (gpm)				
	JFM	AMJ	JAS	OND	Annual Avg.
Development rock runoff	91.7	45.3	93.7	213	111
Tailings drainage	2.9	5	5	8.4	5
Coarse till drainage	28.8	6.7	27.8	156	55
Reclaimed runoff	89	9.6	19.2	57.8	44
Quarterly Totals	**212**	**67**	**146**	**435**	**215**

Domestic Wastewater Discharge (Outfall 003)

Secondary treated domestic wastewater for the Kensington Mine exploration camp is currently discharged to Lynn Canal under a state wastewater permit. The effluent is discharged through an 8 inch HDPE pipe which extends 800 feet into the canal at a depth of 20 feet below water level. During the proposed construction activities, the existing septic system will continue to discharge at the current location at Lynn Canal as Outfall 003.

A new packaged domestic wastewater secondary treatment is planned for the site. The preliminary design for the proposed wastewater collection, treatment and disposal system is described in detail in *Preliminary Design Report, Domestic Wastewater Collection, Treatment, and Discharge* (Montgomery Watson, 1996b). The permanent workforce to be housed at the Project is expected to be approximately 260 workers. The average daily flow for the plant is estimated at 30,000 gpd (20.8 gpm) based on sizing to accommodate 300 people. The new treatment outfall will also discharge to Lynn Canal via the existing outfall.

Stormwater Discharges (Outfalls 004 and 005)

In addition to stormwater generated in the process areas and at the DTF, stormwater discharges also are proposed from the till borrow area and from multiple culverts along the access road. Stormwater runoff from the till borrow areas will be collected in sumps or in low areas and routed to an internal sedimentation pond for settling and infiltration into coarse till materials. Discharge from the pond will only be required during extreme storm events. At these times, stormwater will be pumped from the pond for controlled discharge into an undisturbed wetland area immediately north and upgradient of Sherman Creek (see Figure 2). This discharge is designated as Outfall 004. Stormwater originating from undisturbed areas upgradient of the access road will be transported beneath the road via multiple culverts (see Figure 2). Stormwater from the access road will also be routed to the culverts. For administrative purposes, the discharges from the culverts are collectively designated as Outfall 005. As the Plan of Operations and the road design are finalized, the specific location and volume projected of each culvert discharge will be identified in Coeur's Best Management Practices Plan for the project.

An estimate of the discharge water quality from Outfalls 004 and 005 are provided on form 2F of the NPDES application and incorporated into Section V. of this document. As noted above, Outfalls 004 and 005 discharge to wetlands. There is no direct water quality information on these wetland areas. Runoff from these areas consists of dispersed, nondiscrete overland flows. The water quality of the wetlands is also thought to be similar to the water quality of Sherman Creek and unnamed streams in the area of the proposed DTF. Recent water quality data obtained from four sampling points in two small, intermittent streams in the vicinity of the DTF are comparabe to that of Sherman Creek. These data are presented in Table 2-3 of the NPDES application and Table IV-3 of this document.

III. Background

Small scale mining in the Kensington area occurred at the turn of the century. The relic of this activity is the upper Kensington adit (2,000 foot level). More recent exploration activities have involved the development of several adits and numerous borehole sites; however, current disturbance to the area is limited. Originally, the Kensington Joint Venture submitted federal, state, and local permit applications to reopen the Kensington gold mine. The Joint Venture proposal included mining approximately 4,000 tons of ore per day, with gold extraction through a froth flotation and cyanide leach process. Tailings would have been disposed in a wet tailings impoundment constructed in the Sherman Creek drainage. Mine drainage and surface runoff would also enter the impoundment and effluent from the impoundment, equal in volume to mine drainage and surface runoff, would be discharged into the marine waters of Lynn Canal.

The Joint Venture applications resulted in the development of Draft and Final Environmental Impact Statements (DEIS, June 1, 1991 and FEIS, January, 1992). In October 1994, EPA issued a report entitled *Kensington Gold Mine Project: Technical Assistance Report for the U.S. Army Corps of Engineers, Alaska District* (EPA 910/B-94-004). This report identified a number of unresolved water quality issues related to the project.

In 1995, the Project was purchased in its entirety by Coeur Alaska, Inc. In 1996, Coeur Alaska, Inc. proposed substantial modifications to the Plan of Operations. The primary modifications to the Plan of Operations include, but are not limited to: off-site processing of ore, thus eliminating the cyanide leach process; development of the DTF; and re-direction of effluent from marine waters to fresh waters. The substantial modifications to the Plan of Operations led to the issuance of a draft Supplemental EIS (SEIS) on February 21, 1996. The preferred alternative in the SEIS reflects the Project plan described in this permit.

Since 1989, Coeur Alaska, Inc. has conducted limited exploration activities at the site. As noted above, this has produced 400 to 1,000 gpm of mine drainage, which has been settled and discharged at location 101. The settling ponds also receive runoff from the surface disturbance at the 850 foot level, including the development rock stockpile.

IV. Receiving Water

The two main influences on the hydrologic regime within a watershed are the climatic characteristics of the area and the watershed's physical characteristics. Physical characteristics of the watershed include the aspect, soil type, vegetation cover, and characteristics of the stream channels. The following discussion describes these characteristics and the response they produce within the Project area.

The Kensington Project, as proposed, would be located in the Sherman Creek watershed. The watershed is situated at the western foot of Lions Head Mountain in the Kakuhan Range of the Coast Mountains and is typical of other drainages in this region of southeast Alaska. Slopes are typically very steep with surface cover varying from exposed bedrock at higher elevations to muskeg forests and meadows in lower regions. The main stem of Sherman Creek flows from the base of Horrible Hill and discharges into Lynn Canal at Comet Beach.

A. Precipitation Data

The maritime climate in the region produces a high rate of annual precipitation as a result of the onshore, upslope movement of moist air. Snowfall contributes a significant portion of the total annual precipitation in the watershed with contributions increasing with elevation. There are no glaciers or lakes within the basin; however, a large snowpack can exist throughout the summer at the higher elevations. Precipitation data collected from three nearby weather stations were used to produce an annual estimate of 58.3 inches of precipitation at the 850 foot level. More than 50 percent of the annual precipitation falls during the months of September through December. Chapter 3 of the SEIS presents additional precipitation data.

B. Watershed Characteristics

The Sherman Creek basin has an area of 2,683 acres (4.19 sq. miles) and ranges in elevation from sea level to 5,000 feet. The Sherman Creek watershed consists of three major sub-basins which flow into the main channel of Sherman Creek at an elevation of approximately 500 feet. These three major sub-basins contain the drainages of Ivanhoe, Ophir, and upper Sherman creeks. These sub-basins are characterized by a high channel density and are noted for numerous unnamed (and unmapped) secondary channels which intermittently flow to the main channels (SAIC, 1996).
The Ivanhoe Creek sub-basin has an area of approximately 658 acres (1.03 sq. miles), ranging in elevation from 700 to 5,000 feet. There will be no discharges of process water or stormwater from the Project to Ivanhoe Creek. The Ophir Creek sub-basin consists of approximately 499 acres (0.78 sq. miles) and ranges in elevation between 500 and 5,000 feet. The sub-basin is very similar to the Ivanhoe Creek sub-basin with a large portion occurring above timberline and a sparse vegetation cover. The Project will involve diverting approximately 2,000 feet of Ophir Creek. There will be no discharges to Ophir Creek.

The upper Sherman Creek basin has an area of approximately 700 acres (1.09 sq. miles) ranging in elevation from 500 to 4,000 feet. The sub-basin contains two drainages, the main stem of Sherman Creek as well as South Fork Sherman Creek. As proposed, the discharges from Outfalls 001 and 004 will enter Sherman Creek at the confluence between upper Sherman Creek and the South Fork of Sherman Creek and at a point immediately below the confluence of Sherman Creek and Ophir Creek, respectively (see Figure 2).

The lower Sherman Creek contributing area ranges in elevation from sea level to 500 feet and covers an area of approximately 826 acres (1.29 sq. miles) between the confluence with Ophir Creek and its mouth. Discharges from Outfall 005 will be dispersed to the ground at numerous points between the access road and lower Sherman Creek.

The site of the proposed DTF is located within a small hydrologic basin between the lower main channel of Sherman Creek and the lower main channel of Sweeney Creek. The elevation of this basin ranges from sea level to 1,400 feet, however, over 50 percent of the basin occurs below 250 feet. Runoff from this basin does not contribute to stream flow in either Sherman Creek or Sweeny Creek. This sub-basin has a catchment area of 330 acres (which internally drains through a series of small unnamed stream systems to the beach at Lynn Canal). The discharge from Outfall 002 will enter one of these unnamed streams which flows to the beach at Lynn Canal.

Treated domestic wastewater will enter the marine waters of Lynn Canal via Outfall 003. Lynn Canal is a glacial formed fjord which is part of a complex fjord system in Southeast Alaska. Near Point Sherman, in the vicinity of the Project, the Canal is approximately 10 kilometers wide with a maximum depth of 275 meters, which occurs approximately 2 kilometers from shore. Circulation within the Canal has been described as principally estuarine, with seaward surface flow with a corresponding landward deep flow which balances mass transport.

C. Surface Water Monitoring

1. Monitoring Locations

Surface water monitoring stations have been established to monitor the water quality of mine drainage and settling ponds, as well as a number of other points within the Sherman Creek basin. Table IV-I presents the monitoring stations and their locations. These locations are shown on a map of the area presented as Figure 3.

TABLE IV-1. Water Quality Monitoring Stations

Station Number	Location
101	Existing mine drainage settling ponds
101A	850 foot lower adit
102	South tributary of Ophir Creek
103	South tributary of Ophir Creek (below current discharge)
105	Lower Sherman Creek
106	Lower Sweeny Creek
108	Historical Kensington upper adit at 2,000 foot level
109	Upper Sherman Creek
110	North tributary of Ophir Creek

Water quality monitoring was initiated in 1987 with station numbers 101A, 103, 104 (now 109), and 105. The remaining stations were added between 1988 and 1991. Water quality monitoring also has been conducted in the Sweeny Creek basin (station no. 106) since September, 1987. This station was established to provide comparative water quality data from an undisturbed, adjacent drainage basin.

Monitoring station 101A (mine drainage for the 850 foot lower adit) has limited data from five sampling dates between 1987 and 1989. Monitoring station 101 (settling ponds) was established to monitor discharge water quality from the existing settling ponds used to treat mine drainage from the 850 foot lower adit.
Monitoring station 105 provides an overall characterization of water quality for the Sherman Creek watershed.
Monitoring station 109 (upper Sherman Creek) also provides background data above exploratory operations.

2. Stream Flow

The following discussion is a summary of the material provided in the Surface Water Technical Resource Document - refer to this document and the draft SEIS for detailed descriptions of monitoring results and protocols. Figure 3 depicts the locations of surface water monitoring stations in the Sherman Creek and Sweeny Creek drainages that form the basis of this discussion.

Monitoring stream flow at most stations has proven to be difficult because of the severe climate and steep topography (Montgomery Watson, 1996c). Channel and streambed conditions in many of the measured reaches have been noted to change course and migrate over time. Many of the creeks exhibit intermittent flows. Dynamic conditions such as these are common in high mountain, steep gradient channels like those within the study area. These conditions have produced an incomplete and interrupted record limiting the use of these data in establishing an accurate long-term record of stream flow. Flow data from the upper stations have primarily been used to characterize the relationship of high and low flow conditions to water quality. For this reason, the minimum and maximum reported flows for the monitoring stations presented below are from monthly observations, corresponding with monthly water quality samples as reported by Montgomery Watson (Montgomery Watson 1996c). Table IV-2 presents a summary of observed high and low stream flow measurements recorded at each of the monitoring stations. In some cases, flow measurements have not been reported because extremely low flows within the streambeds precluded accurate measurement.

Table IV-2. Flow Rates at Surface Water Monitoring Locations

Station	Low Flow	High Flow
101	0.2 cfs, Mar-90	1.7 cfs, Nov-91
101A	Not Recorded	
102	Not Recorded	
103	0.4 cfs, Feb-95	32.8 cfs, Oct-91
104	Not Recorded	
105	2.3 cfs, Feb-95	105 cfs, Nov-91
106	Not Recorded	
107	Not Recorded	
108	Not Recorded	
109	1.1 cfs, Jan-91	32.7 cfs, Jun-92
110	1.2 cfs, Mar & Nov-92	26.8 cfs, Jul-92

Stream flows in the four stream systems of the basin containing the area of the proposed DTF were measured during a field characterization study (Konopacky Environmental, 1996). Reported flow rates were very low in all stream channels measured in this basin. Maximum observed flow, across all four streams, ranged between 0.01 and 0.06 cfs (2 to 25 gpm). Minimum observed rates were between 0.002 and 0.01 cfs (1 to 5 gpm).

3. Background Concentrations

Water quality data have been collected from several stations in areas where proposed discharges will occur. These stations are either located above the existing discharge point or in drainages with no known impacts. Station 109 is located in upper Sherman Creek, station 110 is located in an upper Ophir Creek tributary, and station 106 is located in the upper Ophir Creek tributary above where the existing settling pond discharge occurs. These data are summarized in Table IV-3. Station 103 in the Ophir Creek tributary below the existing discharge is also included in Table IV-3. Recent water quality data obtained from four sampling points in two small, intermittent streams in the vicinity of the DTF have also been included. The average of the four values has been included in the table. The comprehensive analytical results for the samples from the unnamed streams are provided in *Kensington Mine Project - Mine Water Discharge 001 & DTF Discharge 002 - Addendum 6 Surface Water Chemistry and Runoff DTF Area* (SRK, 1996e) of the NPDES Application, June 1996.

In general, water quality monitoring results have been consistent with what would be expected in a mineralized area - various metals have been detected intermittently at most monitoring stations although no stations have consistently demonstrated elevated levels of any particular constituents.

Based on water quality analyses, surface water within the Sherman Creek watershed can be classified into two distinct types. With the exception of the water at station numbers 101 and 103, water at all of the surface water monitoring stations can be classified as calcium bicarbonate-type water. Stations 101 and 103 are influenced by the mine drainage discharging from the lower adit and are classified as having calcium sulfate-type water.

Elevated concentrations of nitrate, ammonia, and orthophosphate were detected during several sampling events between 1988 and 1990 at monitoring stations 101 and 103. These detections appear to be related to the period where explosives were used in exploration of the upper and lower adits. The presence of cyanide also has been reported at these two stations. Cyanide is not known to have been used at the site nor would it be expected to occur naturally. The detections correspond with observations of elevated concentrations of nitrate and ammonia noted previously. If specific laboratory procedures are not applied, cyanide can be falsely detected by a laboratory when elevated nitrate is present.

TABLE IV-3. BACKGROUND WATER QUALITY					
Parameter[1] (μg/l unless noted)	Station 109 upper Sherman Creek (Avg/Min/Max)	Station 110 Ophir Creek (Avg/Min/Max)	Station 106 Sweeny Creek (Avg/Min/Max)	Station 103 Ophir Creek tributary (Avg/Min/Max)	Unnamed Creeks (Avg)
Arsenic	1.2/0.5/2.8	NA/<0.5/<5	NA/<0.5/<5	1.8/0.59/50	<0.5
Cadmium	NA/<0.5/<2	NA/<0.2/<2	NA/<0.5/<2	NA/<0.2/<2.0	<0.2
Chromium	NA/<10/<50	NA/<10/<50	NA/<10/<50	NA/<10/<50	<20
Copper	4.3/5/30	4.3/2/41	5.3/5/25	4.1/2.1/50	<2.0
Iron	61/50/700	45/50/480	131/50/2,070	90/50/730	110
Lead	0.76/1/3	3.9/1/186.5	5.4/1/256	4.4/1/217	<2.0
Manganese	NA/<10/170	NA/<15/40	NA/<20/150	23/19/220	<15
Mercury	NA/<0.05/<1	NA/<0.05/<1	NA/<0.05/<1	NA/<0.05/<1	<0.2
Nickel	NA/<10/20	NA/<10/<20	NA/<10/<20	NA/<10/<20	<10
Selenium	NA/<5/<5	NA/<5/<5	NA/<5/<5	NA/<5/<5	<5
Silver	0.11/0.1/1.3	0.10/0.1/1.7	0.13/0.1/1.1	0.17/0.1/1.1	<5
Zinc	7.0/10/30	10/10/150	7.5/10/40	12/10/60	18
Free Cyanide	NA/<5/<5	No Data	NA/<5/<5	NA/<5/<50	ND
Ammonia	60/10/1,380	55/20/670	65/10/1,120	718/20/9,590	ND
Nitrate (mg/l)	0.46/0.01/15.5	0.214/0.03/0.535	0.419/0.015/14.2	3.17/0.09/36.0	ND
TDS (mg/l)	54/16/110	31/8/80	65/20/130	243/31/996	ND
TSS (mg/l)	3.4/1/73	1.7/1/8	4.6/1/85	3.6/1/33	<4.0
pH (s.u.)	7.4/5.7/7.85	7.4/6.7/7.7	7.4/6.3/8.1	7.3/5.7/8.0	ND

NA - Not Applicable
ND - No Data
[1] All metals values are total recoverable.

V. Discharge Composition

The analysis of discharge composition focuses on the anticipated effluent quality from the listed outfalls and their respective sources. The estimated effluent quality presented has been used to evaluate anticipated compliance with proposed permit limits.

A. Mine Drainage (Outfall 001)

Mine Drainage

Mine drainage is characterized by the water quality of the existing discharge (location 101) from the settling ponds below the lower mine adit (850 foot level). The values are assumed to be representative of the influent to the mine water treatment plant. Eighty-nine individual samples have been analyzed and the analytical results subjected to

Robust Statistical Analysis. A detailed description of these results and the statistical evaluation is provided in *Kensington Mine Project Water Quality Monitoring Program. Data Summary and Analysis*, (Montgomery Watson 1996c). The values presented in the following table are influent values and should not be considered representative of the effluent from the mine water treatment system. The treatment system will be designed to ensure compliance with the anticipated effluent limitations. The final design of the treatment system is still being determined and pilot-scale test data are not yet available. A discussion of anticipated composition is included in section VII.3 of this document, Comparison with Effluent Limits.

Table V-1. Summary of Mine Drainage Water Quality (Station 101)

Parameter[1]	Average	Minimum	Maximum
Arsenic (μg/l)	1.9	0.7	5.6
Cadmium (μg/l)	NA	**0.2**	**2.0**
Chromium (μg/l)	NA	**10.0**	**50.0**
Copper (μg/l)	9.0	2.7	150
Iron (μg/l)	278.0	50.0	1,570.0
Lead (μg/l)	1.3	1.0	20.0
Manganese (μg/l)	43.0	20.0	800.0
Mercury (μg/l)	NA	**0.05**	**1.0**
Nickel (μg/l)	NA	**10.0**	**20.0**
Selenium (μg/l)	NA	**5.0**	**5.0**
Silver (μg/l)	0.12	0.1	1.0
Zinc (μg/l)	11.0	10.0	60.0
Ammonia[2](μg/l)	1,793	10.0	22,600
Nitrate[2](mg/l)	2.78	0.01	39.1
TSS (mg/l)	12.0	1.0	140.0
TDS (mg/l)	539.0	70.0	1,268.0
pH (s.u.)	7.9	6.8	8.3

1 Values represent the mean, minimum, and maximum values for water quality monitoring station 101 (Montgomery Watson 1996c) without treatment or dilution.
2 Ammonia and nitrate values represent NH_3-N and NO_3-N respectively.
NA - No detected values.
Note: Bold Values following NA notation indicate minimum and maximum analytical detection limits for the parameter where multiple detection limits occurred in the data set.

As shown above, nitrate and ammonium nitrate were detected at relatively high concentrations in mine discharge water samples collected during 1989 and 1990. Spillage and/or incomplete detonation of explosives used for exploration blasting conducted during 1989 and 1990 may have resulted in leaching of ammonia and nitrates into mine drainage. The most commonly used blasting agent, ANFO, which is usually a mixture of 6 percent diesel fuel oil and 94 percent ammonium nitrate, readily dissolves in water.

Careless handling, storage and loading practices can result in a significant amount of explosive spillage, and poor drilling and loading practices can cause a significant amount of explosives to remain undetonated. Coeur is currently developing explosives Best Management Practices (BMP) to minimize the potential for the leaching of ammonia and nitrate into water resources. The explosives BMPs will include procedures for controlling spills during storage, transfer or loading activities; spill containment and clean-up procedures; and measures to ensure complete detonation of all explosives.

The development and implementation of explosives BMPs as an alternative to providing end-of-pipe treatment for ammonia and nitrate will be required as a special condition of this permit. The BMP Plan required by this permit will incorporate the current available technology and appropriate controls for nitrogen sources related to undetonated explosives (Revey, 1996). Coeur has provided case studies of other mining operations where the implementation of explosives BMPs practices has resulted in a reduction of total ammonia in mine drainage to 2 mg/l or less. Achievement of total ammonia concentration of 2 mg/l or less will ensure compliance with the limits established in the permit. In the event that the use of BMPs does not achieve compliance with the limits, end-of-pipe treatment for ammonia and nitrate to at least this level will be necessary.

The average TSS concentration in the existing mine drainage is 12 mg/l, with a 90th percentile value of 39 mg/l. These concentrations are expected to be greatly reduced by the filtration proposed as a part of the water treatment system and should be an insignificant source of TSS to Outfall 001 discharges.

Process Area Stormwater

Effluent from the mine water treatment system is anticipated to meet the effluent limitations set forth in the permit. The treated mine water will be commingled with stormwater from the process area in cell 2 of the process area sediment pond. The 45 acre drainage area includes the approximately 15 acre temporary waste rock pile. The waste pile rock runoff is assumed comparable in quality to existing mine drainage, and the remainder of the stormwater does not include any other known sources of metals loadings. The assumption that stormwater drainage from the waste rock pile will be no more contaminated than mine drainage is justified based on geochemical tests of the waste rock and ore materials which show that: (1) ore rock has a much higher average total sulfur content than waste rock (1.27% for 39 weighted drill hole ore composits versus 0.15% for 75 waste rock samples); (2) copper abundance is controlled primarily by the sulfide mineral chalcopyrite ($CuFeS_2$), which is associated with areas of pyritic minerialization; and (3) copper is not readily leached from these materials in either static or humidity cell tests conducted on waste rock.

The process area stormwater influent to cell 1 is expected to include elevated levels of TSS. Modeling runs conducted by the applicant using the SEDCAD sediment prediction model have shown TSS discharges at Outfall 001 for the 10-, 25-, and 100-year, 24-hour storm event of 167 mg/l, 280 mg/l, and 517 mg/l, respectively. These data were modeled using worst case conditions and conservative assumptions regarding the volume of runoff and the erodibility of soils in order to optimize the design and performance of the sediment pond. Although they are conservative estimates, these data suggest that the use of flocculants will be required to achieve the 30 mg/l daily maximum and the 20 mg/l average monthly limits. Preliminary studies have identified commercially available flocculants that have effectively reduced TSS concentrations in wastewater samples containing fine materials such as those that may be found in stormwater entering the sediment ponds (GWC, 1996). Given the conservative design of the sediment pond, the design of a flocculant addition system, and the expected low input of TSS from the treated mine water, it is anticipated that TSS levels will be managed below discharge limits.

B. DTF Discharge (Outfall 002) - Compilation of Reclaimed Runoff, Coarse Till Drainage, Tailings Drainage, Development Rock Runoff, and Upland Runoff

The following paragraphs describe the contributing flows and the anticipated combined discharge from the sedimentation pond to Unnamed Creek via Outfall 002.

Reclaimed Runoff

Reclaimed runoff refers to the stormwater that will flow from reclaimed areas of the DTF. This runoff will be collected in the toe drain and directed to the DTF sedimentation pond. The quality of the reclaimed runoff, TSS excepted, is anticipated to be similar to the quality of the unnamed streams located in the area of the DTF. The characteristics of this runoff are presented in Table IV-3. With the exception of zinc (18 μg/l), all metals are below detection levels. TSS values may be higher in the initial years of reclamation but will decline to levels consistent with the Unnamed Creek as vegetation becomes dominant. See below for further discussion of TSS.

Coarse Till Drainage

As noted above, coarse till will be used as a final cover material between the fine till hydraulic barrier and the topsoil. The coarse till is expected to act as a drainage layer for infiltration. Coarse till drainage will flow to the DTF toe drain and sediment pond. Previous reports have assumed groundwater quality within the till borrow area to be similar to the anticipated coarse till drainage. To validate this hypothesis, Coeur performed a leach test of the coarse till material. A mass balance model was used to calculate the potential quality of the leachate entering the pond below the DTF. The mass balance model used the thickness, density, and application rate of till, the infiltration rate, and the life of the mine to proportion the leachate by area; thus resulting in a weighted distribution. To be representative of "worst-case" leaching conditions, five pore volumes of the material were subjected to a distilled water leach solution modified to a pH of 4.5 s.u. The leach solution is potentially more acidic than is likely to occur in nature at the site, although the presence of the overlying, acidic organic topsoil could lower the pH. Analytical results were produced from each pore volume which demonstrated declining metals concentrations from the first to the fifth.

The declining concentrations reflect a washing of the available metals from the course till material. It is reasonable to assume that only those metals present in the coarse till fines, and at or near the surface of the coarser material are actually available for leaching. As successive volumes of leaching solution pass through the material the metals available for leaching are gradually depleted. Therefore metals concentrations will be highest immediately after placement of coarse till material and decline thereafter as continued runoff and percolation through the till deplete the available metals.

To calculate the potential leachate quality entering the sediment pond below the DTF, Coeur employed a simple mass balance model that simulates the maximum areal coverage of till and drainage from precipitation and residual water from dewatering. The values presented in the following table are weighted average values that reflect the depletion of metals from the coarse till material. At any given time over the life of the mine the drainage from the coarse till material will reflect these varying stages of metals depletion. Additional details regarding the model variables and outcomes are provided in Coarse Till Leach Test - Kensington Project (SRK 1996f). It is noted that in reviewing the analytical data provided by Coeur in this study, all but one of the 12 metals for which detectable concentrations were measured showed the expected trend of declining concentrations in subsequent pore volumes. The single exception was the fifth pore volume for zinc which was indicated to be higher than the second, third, and fourth pore volumes. This value was considered to be an anomaly, therefore the fourth pore volume value was substituted for the fifth pore volume concentration in preparing the table that follows. A summary of the coarse till data used to anticipate effluent quality is presented in Table V-2.

TABLE V-2. Coarse Till Characterization Data		
Parameter	MDL	Weighted Average
Aluminum (μg/l)	30.0	2,171.0
Arsenic (μg/l)	1.0	4.1
Barium (μg/l)	3.0	61.7
Cadmium (μg/l)	3.0	ND
Calcium (μg/l)	200.0	24,120.0
Chromium (μg/l)	0.01	ND
Copper (μg/l)	10.0	6.0
Iron (μg/l)	10.0	3,458.0
Lead (μg/l)	0.02	ND
Magnesium (μg/l)	200.0	6,580.0
Manganese (μg/l)	5.0	705.5
Mercury (μg/l)	0.0002	ND
Nickel (μg/l)	0.01	ND
Potassium (μg/l)	300.0	1,260.0
Selenium (μg/l)	0.001	ND
Silver (μg/l)	0.005	ND
Sodium (μg/l)	300.0	3,750.0
Vanadium (μg/l)	5.0	5.8
Zinc (μg/l)	10.0	66.0

ND - Not Detected

Tailings Drainage (Rougher Tails)

In 1996, as part of the overall objective of further understanding waste characteristics (ore, waste rock, tailings, and wastewater) of the Project, Coeur undertook bench-scale testing of the modified on-site ore processing operations (Montgomery Watson 1996d). The intent of the 1996 metallurgical bench scale investigation was to better define the water quality characteristics of the effluent process solution that would be generated by the ore crushing and flotation process used to separate and concentrate the sulfide material containing the mineral value from the parent rock. Previous bench-scale testing had included CIL processing - no longer to be conducted on-site.

The objective of the testing procedure was to use a representative ore sample taken from the Kensington ore body and simulate, as completely as possible, the actual processing procedure necessary to produce an acceptable sulfide concentrate, a dewatered waste rock (rougher tailings), and a rougher tailings filtrate solution for analysis. Approximately 3,000 pounds of ore was originally collected in 1994 from the Kensington mine site and shipped directly to a testing facility in Spokane, Washington. The ore consisted of drill cuttings and bulk samples and is considered representative of ore that will be produced over the life of the mine. Six 55-gallon drums of Sherman Creek water were also collected. These materials were used in the 1996 testing. The 1996 evaluation incorporated all of the water reuse and recycle elements of the actual process flow, to the greatest extent possible, at bench-scale level of operation.

Subsequent to bench-scale work, laboratory analyses of the tailings were performed by two laboratories. Included in Table V-3 are the results of the rougher tailings testing performed by Montgomery and Battelle Laboratories. In an effort to simulate minimal detention pond settling, a flocculant was added and samples were taken after 24 hours of quiescent settling. Montgomery Labs analytical results were for all sample parameters of interest. Battelle's analysis was to provide an ultra-low level evaluation for several key parameters that were below Montgomery Lab detection limits.

Table V-3 provides the results of the evaluation as reported in *Rougher Tailings Evaluation Report* (Montgomery Watson 1996d). A separate document discussing ore collection and characterization is also available (*Geologic Character of the Kensington Gold Deposit*, Coeur Alaska 1996). Coeur conducted column leach testing of a composite sample of rougher tailings obtained during the 1996 bench-scale evaluation. Table V-3 also includes the first pore volume and average data of 5 pore volumes collected from the columns.

Tailings drainage will result from two distinctly different mechanisms. The first is water contained with the tailings when they are placed in the DTF. Although the tails will be dewatered prior to placement, the mechanical pressure exerted by the weight of subsequent lifts will tend to squeeze additional water from the tailings. The second source of tailings drainage will be the infiltration of surface rainfall into the DTF. Although the DTF design is intended to minimize this infiltration it will still occur to at least some degree. While the volume of drainage that will result from mechanical compression is relatively predictable, the drainage resulting from infiltration is very difficult to predict at this time. The Montgomery Watson data is more representative of the water contained in the tailings, while the Coeur leach test data is more representative of infiltration water after prolonged contact with the dry tailings.

For purposes of estimating the effluent quality from Outfall 002, the more conservative (i.e., higher concentration) of the Montgomery Watson 1996 data and the Coeur leach test average values were used to reflect the characteristics of tailings drainage. Consequently, tailings drainage estimates used in the Outfall 002 characterization are representative of worst-case conditions that will occur in the DTF as the result of either water squeezed from the tailings, or infiltration of stormwater into the DTF.

TABLE V-3. Tailings Drainage Data

Parameter	Montgomery Watson Tailings Analysis	Column Leach Test Data (Avg of 5 Pore Volumes)	Column Leach Test Data (First Pore Volume Only)
Arsenic (μg/l)	0.76	3.2	5
Cadmium (μg/l)	< 0.2	< 3	< 3
Chromium (μg/l)	< 20	< 10	< 10
Copper (μg/l)	< 2	< 10	10
Lead (μg/l)	< 2	< 20	< 20
Mercury (μg/l)	0.003	< 0.2	< 0.2
Nickel (μg/l)	< 10	70	350
Selenium (μg/l)	1.23	< 1	1
Silver (μg/l)	< 0.5	< 5	< 5
Zinc (μg/l)	< 10	68	210
Ammonia (μg/l)	4600	NA	NA
Nitrate (mg/l)	36.0	NA	NA
TDS (mg/l)	810	NA	NA

NA - Not Available

The elevated nitrate and ammonia levels shown in the above table are consistent with the elevated levels shown in mine drainage data for station 101. See previous discussion related to the effects of blasting and efforts to minimize future blasting residuals and wastewater contamination.

Small volumes of the following reagents will be used in the flotation process: pine oil frother, potassium amyl xanthate, methyl isobutyl cellulose, flocculents, polymers, surfactants, and scale inhibitors. None of these reagents is expected to effect the compositon of tailings drainage. The original FEIS identified lead nitrate as being used on-site in ore processing. Lead nitrate will now only be used in the assay laboratory. Wastes and wastewaters from the assay lab will be transported off-site for disposal as hazardous wastes.

Development Rock

Development rock will be removed from the mine workings and transported to the DTF. It is anticipated that the water quality of the development rock runoff will be similar to or better than the discharge quality from the lower mine adit. The assumption of mine drainage as the worst case is justified based on geochemical tests of the development rock and ore materials which show that ore rock has a much higher average total sulfur content than waste rock (1.27%, range from 0.24 to 2.59% for 39 weighted drill hole ore composites versus 0.15%, range from 0.01 to 1.01% for 75 development rock samples). Copper abundance is controlled primarily by the sulfide mineral chalcopyrite ($CuFeS_2$), which is associated with areas of pyritic mineralization. Copper is not readily leached from these materials in either static tests or humidity cell tests conducted on development rock and ore samples. Predicted values were shown earlier in this document (Table V-1).

DTF Sediment Pond Discharge (Outfall 002)

A mass balance model was used to calculate the anticipated effluent quality from Outfall 002. The model utilizes the water quality data from the reclaimed runoff, coarse till drainage, tailings drainage, and development rock runoff, and couples these data with the estimated quarterly flows from each source. The mass balance equation estimates the quarterly effluent values for each parameter:

$$C_p = \frac{Q_1C_1 + Q_2C_2 + Q_3C_3 + Q_4C_4}{Q_1 + Q_2 + Q_3 + Q_4}$$

where:

C_p = concentration of some parameter (mg/L)
Q_1 = DTF seepage flow (gpm)
C_1 = concentration in DTF seepage (mg/L)
Q_2 = reclaimed area runoff flow (gpm)
C_2 = concentration in reclaimed area runoff (mg/L)
Q_3 = development rock runoff flow (gpm)
C_3 = concentration in development rock runoff (mg/L)
Q_4 = coarse till seepage flow (gpm)
C_4 = concentration in coarse till seepage (mg/L)

The highest quarterly value for each parameter is then used to predict the most conservative anticipated effluent value. These values represent the anticipated effluent quality of the discharge from the DTF sedimentation pond. Settling within the pond, including periodic addition of flocculants within the pond, may result in lower metals concentrations.

The individual mass balance tables for each parameter are included as Attachment A. For purposes of estimating Outfall 002 discharge quality, values reported below the detection levels in all samples from the individual sources have been assumed equal to zero within the mass balance equation.

TABLE V-4. Predicted Outfall 002 Effluent		
Parameter	002 Discharge	Remarks
Arsenic (μg/l)	2.46	
Cadmium (μg/l)	0.0	Not detected in any source
Chromium (μg/l)	0.0	Not detected in any source
Copper (μg/l)	6.92	
Lead (μg/l)	0.88	
Mercury (μg/l)	0.0	Not detected in any source
Nickel (μg/l)	5.22	
Selenium (μg/l)	0.09	
Silver (μg/l)	0.08	
Zinc (μg/l)	32.76	
Ammonia (μg/l)	1,565	
Nitrate (mg/l)	4.59	
TSS (mg/l)	NA	See discussion in text

The runoff influent to the DTF is expected to include elevated levels of TSS. Modeling runs conducted by the applicant using the SEDCAD model show TSS discharges at Outfall 002 for the 10-, 25-, and 100-year, 24-hour storm event of 347 mg/l, 574 mg/l, and 1,001 mg/l, respectively. Like the mill area TSS evaluation, these data were modeled using worst case conditions and conservative assumptions regarding the volume of runoff and the erodibility of all sources comprising the DTF in order to optimize the design and performance of the sediment pond. These data do, however, suggest that the use of flocculants will be required to achieve the TSS limits at the outfall. Preliminary studies have identified commercially available flocculants that have effectively reduced TSS concentrations in samples, and the applicant has designed a flocculant addition system to add and mix flocculants to the sediment pond. Given the conservative design of the sediment pond and the design of a flocculant addition system, it is anticipated that TSS levels will be managed below the 30 mg/l, daily maximum, and 20 mg/l, monthly average limits

There are insufficient data to specify TDS levels in the DTF effluent. However, TDS levels in the DTF are expected to be less than 1,000 mg/l. As a worst-case scenario, waste rock runoff could have comparable TDS levels to mine drainage - 787 mg/l. For tailings seepage, the TDS level in effluent from pilot mill testing conducted by Coeur (1996c) was 810 mg/l. Reclaimed area runoff and coarse till drainage would not be expected to have elevated levels of TDS, i.e., TDS levels in these flows should be well below 1,000 mg/l.

C. Domestic Wastewater (Outfall 003)

The new domestic package-plant is in design and is currently not operational. The package-plant will be a standard "off-the-shelf" system designed to meet secondary treatment standards.

D. Stormwater From Till Borrow Area and Undisturbed Areas (Outfalls 004 and 005)

As previously indicated, with the exception of TSS, the water quality of the effluent discharged via these outfalls is estimated to be similar to the water quality of Sherman Creek and the unnamed streams in the vicinity of the DTF. The analytical data for these streams is presented in Table IV-3. TSS concentrations from the borrow area and from the access road runoff are expected to be minimized with the proper use of BMPs.

VI. Permit Conditions

In developing the proposed permit, EPA has evaluated the concentrations of pollutants in the wastewater sources as well as the anticipated levels after treatment, relative to the levels allowed under federal regulations and state water quality standards.

A. General Approach

Sections 101, 301(b), 304, 401, and 402 of the Clean Water Act provide the basis for the effluent limitations and other conditions in the draft permit. EPA evaluates discharges with respect to these sections of the Act and relevant NPDES regulations in determining which conditions to include in the permit.

In general, EPA first determines which technology-based limits are required, as well as best management practices or other requirements. EPA then evaluates the effluent quality expected to result from these controls, to see if the effluent could result in any exceedances of the water quality standards in the receiving water. If exceedances could occur, EPA must include water quality-based effluent limits in the permit. The permit limits will thus reflect whichever limits (technology-based or water quality-based) are most stringent.

Under section 308 of the Act and 40 CFR 122.44(i), EPA must also include monitoring requirements in the permit to determine compliance with effluent limitations. Effluent and ambient monitoring may also be required to gather data for future effluent limitations or to monitor effluent impacts on receiving water quality.

The basis for each permit limit is described in more detail below.

B. Technology-based Evaluation

1. Statutory basis for Technology-Based Limits

The Act requires particular categories of industrial discharges to meet effluent limitations established by EPA. The Act initially focused on the control of "traditional" pollutants (conventional pollutants and some metals) through the use of Best Practical Technology (BPT). Industries were required by Section 301(b)(1)(A) of the Act to meet this level of control by July 1, 1977. Section 301(b)(3) of the Act allowed a deadline of March 31, 1989, under certain circumstances, but that deadline has also passed. Thus, permits issued after March 31, 1989, must include any conditions necessary to ensure that the BPT level of control is achieved.

Sections 301(b)(2) and (3) of the Act require further technology-based controls on effluent. After March 31, 1989, all permits for new sources are required by section 301(b)(2) and (3) of the Act to contain effluent limitations for all categories and classes of point sources which control toxic pollutants and nonconventional pollutants through the use of best available demonstrated technology (BADT), and best conventional pollutant control technology (BCT) for conventional pollutants. In no case may BCT or BADT be less stringent than BPT. BADT is specifically applied through New Source Performance Standards (NSPS).

In many cases, BCT and NSPS limitations are based on effluent guidelines developed by EPA for specific industries. Where EPA has not yet developed guidelines for a particular industry or a particular pollutant, permit conditions must be established using Best Professional Judgement (BPJ) procedures (40 CFR 122.43, 122.44, and 125.3).

2. Effluent Limitation Guidelines

Federal Effluent Guidelines applicable to the Project are found in 40 CFR Part 440, Subpart J - Copper, Lead, Zinc, Gold, Silver, and Molybdenum Ores Subcategory. Specifically, 40 CFR Part 440.104 - Effluent limitations representing the degree of effluent reduction attainable by the application of NSPS. The limitations applicable to the discharge from Outfalls 001 and 002 are presented in Table VI-1.

TABLE VI-1. 40 CFR Part 440 NSPS Limits

Effluent Characteristic	Effluent Limitations	
	Maximum for any 1 day (mg/l)	Average of daily values for 30 consecutive days (mg/l)
Cu	0.30	0.15
Zn	1.5	0.75
Pb	0.6	0.3
Hg	0.002	0.001
Cd	0.10	0.05
TSS	30	20
pH	*	*

* Within the range of 6.0 to 9.0

The regulations allow no discharge of process water from new source mills in the subcategory that use froth flotation. An exemption is provided for net precipitation. Coeur Alaska, Inc. proposes to operate a new source froth flotation operation at Kensington, and the DTF is subject to the no discharge requirement after initial tailings placement begins. However, the projected discharge will essentially equal the net precipitation over the life of the mine. This "net precipitation discharge" is subject to the technology-based limits shown above.

An exemption from the above technology-based effluent limitations is allowed for facilities that are designed to contain the maximum drainage produced by the 10-year, 24-hour storm event (40 CFR Part 440 Subpart L). However, both the mine drainage and DTF settling ponds are continuous discharge units, and the discharges from Outfall 001 and Outfall 002 do not qualify for the exemption. The technology-based standards are not applicable to waters which are water quality limited. For all parameters, with the exception of TSS, the applicable water quality-based limits are more stringent than the above standards.

3. <u>Technology-based Permit Requirements</u>

a. <u>Total Suspended Solids</u>

BPT guidelines require that Total Suspended Solids concentrations in the effluent not exceed 30 mg/l as a daily maximum and 20 mg/l as a monthly average. These limits will apply to Outfalls 001 and 002. Daily maximum limits shall be applied to any particular effluent sample while the monthly average limit will be calculated as the mean of all effluent samples collected in a month.

b. BCT Domestic Wastewater (Outfall 003)

Domestic wastewater from the personnel camp is proposed to be treated with the use of a package-plant capable of performing secondary treatment. The effluent from the package-plant will be discharged to Lynn Canal via Outfall 003. The proposed permit contains effluent limitations that are indicative of secondary treatment performance. The limitations are based on the Alaska wastewater disposal regulations (18 AAC 72). The state regulations require secondary treatment of domestic wastewater unless a reduced treatment level is established by ADEC in response to a request by the applicant. Secondary treatment is defined in both the state regulations and in federal regulations (40 CFR Part 133) as a monthly average limit of 30 mg/l and weekly average limit of 45 mg/l for BOD_5 and TSS. These limits apply at the domestic wastewater treatment plant discharge before the effluent mixes with the receiving water. Fecal coliform limits are also set by state standards.

C. Water Quality-based Evaluation

1. Statutory Basis for Water Quality-Based Limits

Section 301(b)(1) of the Act requires the establishment of limitations in permits necessary to meet water quality standards by July 1, 1977. Discharges to state waters must also comply with limitations imposed by the state as part of its certification of NPDES permits under 401 of the Act.

The NPDES regulations at 40 CFR 122.44(d)(1) require that permits include limits on all pollutants or parameters which "are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, including state narrative criteria for water quality."

The regulations require that this evaluation be made using procedures which account for existing controls on point and non-point sources of pollution, the variability of the pollutant in the effluent, species sensitivity (for toxicity), and where appropriate, dilution in the receiving stream. The limits must be stringent enough to ensure that water quality standards are met, and must be consistent with any available wasteload allocation.

The regulations also specifically address when toxicity and chemical-specific limits are required. A toxicity limit is required whenever toxicity is at a level of concern relative to either a numeric or narrative standard for toxicity. The only exception is where chemical-specific limits will fully achieve the narrative standard. A chemical-specific limit is required whenever an individual pollutant is at a level of concern (as described above) relative to the numeric standard for that pollutant. The regulations also provide three options for developing a chemical-specific limit needed to control a pollutant which does not have a numeric standard, but is contributing to a problem with the narrative standard.

This is a new source permit and is subject to Alaska's antidegradation policy (18 ACC 70.101(c)). The state of Alaska will address the application of this policy to the Kensington mine discharges in their 401 certification of this permit.

2. Wasteload Allocations and Mixing Zone Boundary

The wasteload allocation is the concentration (or loading) of a pollutant that may be discharged by the a permittee without exceeding water quality criteria in the receiving water. For the Kensington Project, Coeur has not applied for a mixing zone. Therefore, the effluent from Outfalls 001, 002, and 003 must meet the water quality standards at end-of-pipe, and the applicable water quality criteria (see below) serve as the wasteload allocations.

a. Water Quality Criteria

Alaska has adopted federal water quality criteria by reference from a variety of sources:

- The July 29, 1985 Federal Register Notice (50 FR 30784) contains the applicable freshwater numeric criteria for ammonia (acute and chronic), cadmium (acute and chronic), chromium (VI) (acute and chronic), copper (acute and chronic), lead (acute and chronic), and mercury (acute and chronic).

- The November 28, 1980 Federal Register Notice (45 FR 79318) contains the applicable freshwater numeric criteria for nickel (aquatic life chronic and human health), silver (acute and chronic), and zinc (chronic).

- *The Quality Criteria for Water* (EPA 1976) hereafter referenced as the *Red Book* contains the applicable freshwater numeric criteria for iron, manganese, and nitrate.

- EPA promulgated freshwater and saltwater acute aquatic life criteria and human health criteria for Alaska in the December 22, 1992 Federal Register Notice (59 FR 60848): Water Quality Standards, Establishment of Numeric Criteria for Priority Toxic Pollutants, States Compliance Final Rule, hereafter referenced as the National Toxics Rule (NTR). The NTR contains the applicable freshwater numeric criteria for nickel (acute), selenium (acute and chronic), and zinc (acute).

- EPA has promulgated enforceable standards for drinking water (Maximum Contaminant Levels, or MCLs) for arsenic, cadmium, chromium, mercury, nickel, selenium, and nitrate.

- EPA promulgated aesthetic standards related to taste, odor, or color (Secondary Maximum Contaminant Levels or SMCLs) for copper, iron, manganese, zinc, and TDS.

Table VI-2 lists the parameter, criteria source, the most stringent of applicable criteria, and aquatic life acute and chronic criteria and human health criteria.

TABLE VI-2. Applicable Water Quality Criteria					
Parameter	Criteria Source	Most Stringent Criteria[1,4]	Aquatic Acute	Aquatic Chronic	Human Health
Arsenic (μg/l)	NTR	Human Health	360	190	0.18
Cadmium (μg/l)	1985 FR	Aquatic Life	**Hardness Dependent**[2]		10.0
Chromium (μg/l)	1985 FR	Aquatic Life	16.0	**11.0**	50.0
Copper (μg/l)	1985 FR	Aquatic Life	**Hardness Dependent**[2]		1,000
Iron[3] (μg/l)	Red Book	Aquatic Life	NA	**1,000**	**300**
Lead (μg/l)	1985 FR	Aquatic Life	**Hardness Dependent**[2]		50.0
Manganese[3] (μg/l)	Red Book	Drinking water	NA	**100**	**50.0**
Mercury (μg/l)	1985 FR	Aquatic Life	2.4	**0.01**	0.14
Nickel (μg/l)	1980 FR	Human Health	**Hardness Dependent**[2]		**13.4**
Selenium (μg/l)	NTR	Aquatic Life	20.0	**5.0**	NA
Silver (μg/l)	1980 FR	Aquatic Life	**Hardness Dependent**	**0.12**	50
Zinc (μg/l)	1980 FR	Aquatic Life	**Hardness Dependent**	**47.0**	5,000
Nitrate (μg/l)	Red Book	Human Health	NA	NA	10,000
Ammonia, Total (mg/l)	1985 FR	Aquatic Life	**pH/Temp Dependent**		NA
TDS[5] (μg/l)	Alaska Std.	Site Specific	1,000[5]		1,000[5]
pH (s.u.)	Alaska Std.	Aquatic Life	6.5 - 8.5		NA

[1] Most Stringent Criteria are shown in bold type.
[2] See below for hardness dependent limits.
[3] The applicable human health standards for iron and manganese are based on Alaska's drinking water criteria. The drinking water criteria for these parameters are advisory only to ensure taste and odor control.
[4] All metals values are total recoverable.
[5] The TDS criterion reflects Coeur's request for this site-specific TDS criterion from the state of Alaska.

Metals toxicity generally decreases as hardness increases, therefore, even moderate increases in hardness, typically measured as $CaCO_3$, can have significant effects on metals availability and associated water quality criteria. To compensate for this, EPA has established hardness-dependent criteria for several metals including: cadmium, copper, lead, nickel, silver, and zinc.

b. Hardness-based Criteria

(1) Limits for 60 mg/l Fixed Hardness

The hardness of wastewater discharges from the Project will be significantly higher than the background hardness in local streams. The hardness downstream of each discharge will vary primarily depending on the ratios of the discharges to instream flows, i.e., hardness will be low during high stream flow events and high during low flow periods. To develop a conservative estimate of likely instream hardness conditions below the discharges from Outfalls 001 and 002, EPA evaluated information provided by the applicant on stream flows, existing hardness data for stations 101 and 109, and projected flows and hardness levels for discharges under full operations. To calculate a limit, EPA considered the 25th percentile hardnesses at stations 101 and 109, 272 mg/l and 33 mg/l, respectively. These data provided a conservative estimate (60 mg/l) of "low hardness" in Sherman Creek below the discharge. Existing hardness and flow data are generally not available for Unnamed Creek. However, EPA believes that 60 mg/l is also a conservative estimate of instream hardness in Unnamed Creek below the DTF because average monthly flows should be significantly lower than Sherman Creek. However, rather than selecting a single, conservative set of permit limits, EPA has explored other options for hardness-based limits development.

(2). Tiered Hardness-based Limits

Water quality sampling data from Sherman Creek and surrounding tributaries indicate that hardness concentrations fluctuate within the receiving stream and are greatly affected by the contributing flows from the existing discharge at the mine water settling ponds. The water quality data summarized in Table 2-4 of the NPDES permit application demonstrate that in upper Ophir Creek (stations 110 and 102) and upper Sherman Creek (station 109) the natural hardness is low with 90th percentile values below 50 mg/l. The data also show that below the point of admixture in the Ophir Creek tributary (station 103), the hardness is elevated with a 90th percentile value of 332 mg/l and a mean value of 169 mg/l. The effluent has a mean hardness value of 349 mg/l at station 101.

This permit provides "tiered" limits that address the likely increase of instream hardness due to the proposed discharges, while protecting against any condition under which the instream hardness is low (e.g. peak flows). The hardness dependent water quality standards and permit limits have been calculated based on tiers of 50, 100 and 200 mg/l of hardness. This tiered system will result in a set of effluent limits based on the measured, downstream hardness within the receiving streams. The Permittee is required to measure the hardness of the receiving streams, weekly, immediately downstream of the Outfall 001 and 002 discharges at the same time as effluent sample collection, and must report these data with the DMR for that month.

A measured value of 50 to 100 mg/l hardness will result in criteria calculated based on 50 mg/l hardness. At measured values greater than 100 mg/l but less than 200 mg/l, the criteria will be calculated with a hardness value of 100 mg/l, and at measured values greater than 200 mg/l, the criteria will be calculated at 200 mg/l. Based on the flow and quality of the receiving water and existing and projected discharges, the hardness immediately downstream of Outfalls 001 and 002 is not anticipated to be below 50 mg/l. Table VI-3 presents the water quality criteria for the hardness-based parameters at 50, 100, and 200 mg/l hardness. Non-hardness dependent criteria do not change. The daily maximum permit limit will be based on the criterion associated with the hardness measured on a given day. For monthly average limits, the Permittee will average the hardness values collected over the month to determine the tiered monthly average limits.

TABLE VI-3. Applicable Water Quality Criteria at 50, 60, 100, and 200 mg/l Hardness			
Parameter[1,2]	Aquatic Acute	Aquatic Chronic	Human Health
Limits for 50 mg/l Hardness			
Cadmium (μg/l)	1.79	**0.66**	10
Copper (μg/l)	9.22	**6.54**	1000
Lead (μg/l)	33.78	**1.32**	50.0
Nickel[3] (μg/l)	789.0	59.09	**13.4**
Silver[3] (μg/l)	1.23	**0.12**	50
Zinc[3] (μg/l)	65.04	**47.0**	5,000
Limits for 100 mg/l Hardness			
Cadmium (μg/l)	3.92	**1.13**	10
Copper (μg/l)	17.73	**11.82**	1000
Lead (μg/l)	81.65	**3.18**	50.0
Nickel[3] (μg/l)	1,418.24	100.08	**13.4**
Silver[3] (μg/l)	4.06	**0.12**	50
Zinc[3] (μg/l)	117.02	**47.0**	5,000
Limits for 200 mg/l Hardness			
Cadmium (μg/l)	8.57	**1.95**	10
Copper (μg/l)	34.06	**21.38**	1000
Lead (μg/l)	197.31	**7.69**	50.0
Nickel[3] (μg/l)	2,549.31	169.48	**13.4**
Silver[3] (μg/l)	13.37	**0.12**	50
Zinc[3] (μg/l)	210.54	**47.0**	5,000

1 Most stringent criteria are shown in bold type.
2 All metals values are total recoverable.
3 Only acute hardness dependent and, as shown in Table VII-2, chronic is more stringent.

(c) Ammonia Criteria

The ammonia criteria are presented in EPA's 1986 Gold Book. Total ammonia criteria for fresh water are pH and temperature dependant. Criteria concentrations for the pH range of 6.5 to 9.0 and the temperature range of 0°C to 30°C are provided within the Gold Book to calculate the pH and temperature dependent criteria. The criteria for total ammonia become more stringent with increasing pH and increasing temperature. To determine the applicable criteria for this permit, EPA has used the 90th percentile pH and temperature values of 7.75 s.u. and 10°C, respectively for station 109 in upper Sherman Creek.

3. <u>Permit Limit Derivation</u>

a. <u>Calculating Effluent Limits</u>

Applicable water quality criteria are compared to reported effluent values to determine if limits are needed for individual parameters. Under 40 CFR 122.4(d)(1), limits must be included if the discharge shows "reasonable potential" to exceed water quality standards. EPA's *Technical Support Document for Water Quality-Based Toxics Control* (TSD, 1991) defines "reasonable potential" as being within a percentage of the wasteload allocation. The TSD establishes a statistical procedure for determining whether "reasonable potential" exists on the basis of effluent monitoring data.

In deriving the water-quality based limits, EPA has applied the statistical permit limit derivation approach described in the TSD. This approach takes into account the wasteload allocation and effluent variability in setting limits which are low enough to ensure that the water quality standards are met. For this permit, the wasteload allocations are equal to the water quality criteria, as no mixing zone or dilution has been applied. Discharges from Outfalls 001 and 002 are required to comply with the most stringent water quality-based limits at end-of-pipe. The approach also takes into account the difference in time frames and frequency of sampling between the water quality standards and monthly average and daily maximum limits. In addition to the water quality standards, EPA used the following values in deriving limits using the formulas in the guidance documents:

Probability value for long-term average concentration	99%
Probability value for monthly average limits	95%
Probability value for daily maximum limits	99%
Coefficient of Variation	60%
**********Frequency of Monitoring	
Chronic Whole Effluent Toxicity	Monthly
Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Zinc, Unionized Ammonia, Nitrate	Weekly

Based on the above limit derivation procedure, the proposed permit contains a number of limits that fall below the capability of current analytical technology to detect and/or quantify specific parameters. EPA's draft "National Guidance for the Permitting, Monitoring, and Enforcement of Water Quality-Based Effluent Limitations Set Below Analytical Detection/Quantification levels" (March 1994) outlines objectives for achieving consistency in establishing permit pollutant limitations for pollutants that are set below detection levels, taking into consideration the capabilities and uncertainties of currently available analytical methodologies.

EPA's guidance specifies that, regardless of the ability to measure to the level of the permit limit, the value provided for the maximum and average effluent limits in the permit should be expressed as the calculated limit. The inability to measure to the necessary level of detection is addressed by establishing the Minimum Level (ML) as the quantification level for use in laboratory analysis and for reporting Discharge Monitoring Report (DMR) data for compliance evaluations. In the absence of promulgated MLs, Interim MLs should be used. Interim ML values can be derived most effectively as a multiple of the existing Method Detection Limit (MDL) value for a given analyte. The Interim ML is approximated by 3.18 times the published MDL.

b. Effluent Limitations for Outfalls 001, 002, and 003

After considering both the 60 mg/l fixed hardness limits, and the tiered limits, EPA has used the tiered limits approach in developing the permit. The criteria presented in Table VI-2 have been applied within the TSD statistical approach to establish permit limits. The effluent limits for Outfalls 001 and 002 along with the projected discharge characteristics are provided in Table VI-4. Effluent limits for hardness dependent criteria are presented at 50, 100, and 200 mg/l hardness.

Effluent limits for Outfall 003 are presented in Table VI-5. Fecal Coliform limits are based on Alaska Water Quality Standards without the dilution afforded by a State authorized mixing zone. Coeur has not applied for a mixing zone for this discharge. Because disinfection is not proposed, Coeur will need to apply for a mixing zone for fecal coliform bacteria in the domestic waste discharge in accordance with ADEC regulations. Once a mixing zone determination is made, final permit limits will be adjusted accordingly.

TABLE VI-4. Effluent Limitations for Outfalls 001 and 002					
Parameter	Daily Max[1] (Hardness: 50/100/200)	Monthly Avg[2] (Hardness: 50/100/200)	Untreated Mine Drainage, Sta. 101, 90th Percentile Conc.	Treated Mine Drainage, Outfall 001 (µg/l)	Projected Outfall 002 Discharge[3] (µg/l)
Arsenic (μg/l)[4]	0.36	0.18	3.2	1.7[5]	2.46
Cadmium (μg/l)	1.08/1.86/3.21	0.54/0.93/1.60	ND	ND	ND
Chromium (μg/l)	16.0	7.98	ND	ND	ND
Copper (μg/l)	9.22/17.73/34.06	4.60/8.84/16.98	20	3.9[6]	6.92
Lead (μg/l)	2.16/5.23/12.63	1.08/2.61/6.30	3.0	1[5]	0.88
Mercury (μg/l)[4]	0.02	0.01	ND	ND	ND
Nickel (μg/l)	26.88	13.40	ND	ND	5.22
Selenium (μg/l)[4]	8.21	4.09	ND	ND	0.09
Silver (μg/l)[4]	0.20	0.10	0.21	0.1[5]	0.08
Zinc (μg/l)	65.04/77.21/77.21	32.42/38.48/38.48	23	10[5]	32.76
Ammonia, Total (mg/l)	3.45	1.72	< 2[7]	< 2[7]	1.56
Nitrate (mg/l)	20.0	10.0	< 10[7]	< 10[7]	4.59
TDS (mg/l)	1,000[8]	1,000[8]	787.0	< 800	<1,000
TSS (mg/l)	30.0	20.0	*	*	*
pH[9] (s.u.)	range 6.5 - 8.5		6.8 - 8.3	6.8 - 8.3	6.8 - 8.3

1 Daily maximum limits shall be applied to any one sample.
2 Monthly average limitations shall be the mean of the samples taken for that month.
3 Values represent the anticipated effluent quality from Outfall 002 as presented in Table V-4.
4 One or more limits for these pollutants fall below the minimum level (ML) listed in Table 5. The listed minimum level shall be used as the compliance evaluation level for these parameters.
5 Based on median detected soluble concentrations at Station 101 (1991-1995)
6 Based on theoritical hydroxide solubility at pH 8.
7 Values assume implementation of explosives BMPs as discussed in Section V.1.
8 TDS criteria are based on site-specific standard applied for by the permittee - pending ADEC rulemakings
9 pH data are the range of values reported to date for station 101. There are no data to describe the pH range for the DTF area discharge. However, because of the relatively inert tailings, waste rock , and coarse ltill and the contribution from reclaimed area runoff, a pH range comparable to the mine drainage has been included in the table. These levels are comparable to pH levels detected in lower Sherman Creek.
* See discussion in text regarding TSS levels in discharges.

Table VI-5 Effluent Limitations for Outfall 003			
EFFLUENT PARAMETER	DAILY MAXIMUM	SEVEN DAY AVERAGE	MONTHLY AVERAGE
Total Flow	60,000 gpd		30,000 gpd
BOD_5 (mg/l)	60 mg/l	45 mg/l	30 mg/l
TSS (mg/l)	60 mg/l	45 mg/l	30 mg/l
Fecal Coliform (#/100 ml)	43*		14*
pH (s.u.)	6.5-8.5		

* These limits are based on Alaska Water Quality Standards without dilution afforded by an authorized mixing zone.

c. Comparison of Effluent Limits with Anticipated Effluent Quality

Table VI-4 includes a comparison of the permit limits for Outfalls 001 and 002 and projected effluent quality. As indicated in Table IV-4, the treatment plant could be operated to achieve compliance with all indicated discharge limits at Outfall 001. The treatment technology proposed (precipitation and settling followed by filtration) would be effective in reducing virtually all metals present in insoluble forms. The treatment system will use lime or some other source of alkalinity to raise the pH to between 8 and 8.5 pH s.u. Under these pH conditions, soluble metal ions such as copper will form insoluble hydroxide precipitates. Other metal ions such as arsenic, lead, nickel, silver, and zinc are expected to be present primarily as insoluble species. This assumption is supported by the soluble and insoluble metals data collected in the station 101 discharge (Montgomery Watson, 1996a).

The flocculant settling that will follow the addition of a coagulating agent in the treatment system will effectively capture these insoluble species through agglomeration and adsorption with the resulting floc. Insoluble fines which fail to settle will be removed by the filtration step. Other facilities using the same treatment technology have also noted some reduction in soluble metal species, probably through adsorption and co-precipitation.

The treated mine drainage concentration for copper in Table IV-4 is based on the theoritical copper hydroxide solubility at pH 8.5. Treated mine drainage concentrations for arsenic, lead, silver, and zinc are based on the soluble concentrations detected in the station 101 discharge. The projected levels of treated mine drainage are conservative in that most soluble metals concentrations at station 101 were non-detects, thus use of only the detected soluble values represents the worst case conditions. In addition, no removal of soluble species through co-precipitation or adsorption is assumed, and thus the reductions shown may well be understated.

These conservative assumptions not withstanding, if operational monitoring indicated that higher than anticipated levels of metals were present in soluble (dissolved) form, some preconditioning (e.g., sulfide or borohydride addition) could be used to reduce metal solubility. This would increase the removal efficiency of the treatment system and assure the system would achieve the discharge concentrations shown.

A further reason for confidence that the permit limits for Outfall 001 will not be exceeded is that the existing data for monitoring locations 101 and 103 and the projected discharge flows show that the instream hardness should generally be greater than 200 mg/l, except during peak flow conditions.

Reported background levels of arsenic are typically higher than the applicable water quality criterion (.18 μg/l), and lower than the applicable "minimum level" for arsenic (3 μg/l). The minimum level represents the lowest quantifiable level that can be achieved using standard methods. The projected discharge concentrations of arsenic at Outfalls 001 and 002 are below 3 µg/l.

Similar to Sherman Creek, the hardness in Unnamed Creek should generally be greater than 200 mg/l, except during peak flow conditions. Under peak flow conditions, EPA expects that lower hardness values could be observed but also significant dilution would be available in the settling ponds to ensure compliance with the applicable copper limits.

Section III describes anticipated TSS levels in the discharges from Outfalls 001 and 002 and projected compliance with technology-based TSS limits. Projected pH ranges for Outfall 002 are not available. However, the rougher tailings are expected to have low sulfide content and acid generation potential.

The proposed permit contains TDS limitations for Outfalls 001 and 002 based on a site-specific criterion (1,000 mg/l) proposed by the state of Alaska for the project area on January 28, 1997. Because the facility is not expected to achieve compliance with the currently applicable criteria, a final permit cannot be issued until the state finalizes this rulemaking.

d. Whole Effluent Toxicity

Alaska's water quality standard for whole effluent toxicity (18 ACC 70.023) states that effluents must not cause chronic toxicity, defined as 1.0 chronic toxic unit (TU_C), in the receiving water at the point of discharge or beyond a mixing boundary. The proposed permit contains numeric effluent limits to ensure compliance with this standard at end-of-pipe (no mixing zone). The same statistical approach (from EPA's Technical Support Document) for establishing chemical-specific limits is used to establish toxicity limits.

In order to determine compliance with the chronic toxicity limits, the permit requires monthly laboratory tests of the effluent with standard EPA test organisms (cerodaphnia dubia, fathead minnows, and selenastrum capricornutum). An NOEC (No Observable Effects Concentration) is obtained for each test and converted to TU_Cs for comparison against permit limits.

e. Effluent Limitations For Outfalls 004 and 005

The permit does not include numeric effluent limitations for Outfalls 004 and 005. EPA has proposes that these discharges be controlled through implementation of an approved BMP Plan. The effectiveness of the BMPs will be measured through regular inspections, and through the stormwater discharge and instream monitoring requirements described in Section VII.D.

VII. Monitoring Requirements

Under Section 308 of the Act and 40 CFR 122.44(i), EPA must require a discharger to conduct monitoring whenever necessary to determine compliance with effluent limitations, assist in the development of effluent limitations, and assess the quality of receiving waters. The proposed permit contains both effluent and ambient monitoring requirements.

Quality Assurance Project Plan

Prior to initiating sampling, the Permittee shall prepare a Quality Assurance Project Plan for monitoring and analysis which includes: sampling locations, a brief description of the stream morphology at each sample location, sample collection and handling procedures, sample transport and chain-of-custody procedures, laboratory analysis, quality assurance/quality control protocols, and data submission schedules. The plan shall provide this information for all of the required monitoring described herein.

A. Process Outfall Monitoring

To assure compliance with the effluent limitations set forth in this permit, the Permittee will be required to monitor the discharges from Outfalls 001, 002, and 003 on a routine basis. Tables VII-6, VII-7, and VII-8 present the required monitoring parameters, frequencies, and sample types. Table VII-9, provides a listing of the required detection levels and minimum levels for each parameter.

TABLE VII-6. Monitoring Requirements for Outfalls 001 and 002

EFFLUENT PARAMETERS (μg/l unless noted)	MONITORING REQUIREMENT		
	Sampling Frequency[1]	Influent/ Effluent[2]	Sample Type
Arsenic[3] (µg/l)	Weekly	I/E	24-hour Composite
Cadmium[3] (µg/l)	Weekly	NA	24-hour Composite
Chromium[3] (µg/l)	Weekly	I/E	24-hour Composite
Copper[3] (µg/l)	Weekly	I/E	24-hour Composite
Lead[3] (µg/l)	Weekly	I/E	24-hour Composite
Mercury[4] (µg/l)	Weekly	I/E	24-hour Composite
Nickel[3] (µg/l)	Weekly	I/E	24-hour Composite
Selenium[3] (µg/l)	Weekly	I/E	24-hour Composite
Silver[3] (µg/l)	Weekly	I/E	24-hour Composite
Zinc[3] (µg/l)	Weekly	I/E	24-hour Composite
Whole Effluent Toxicity, Chronic[5]	Monthly	I/E	24-hour Composite
Nitrate (mg/l)	Weekly	E	Grab
Ammonia, Total (mg/l)	Weekly	E	Grab
Total Suspended Solids, (mg/l)	Daily	I/E	24-hour Composite
Total Dissolved Solids, (mg/l)	Weekly	E	24-hour Composite
pH (s.u.)[6]	Continuous	E	Recorder
Temperature (ºC)	Weekly	E	Grab
Flow (MGD)[7]	Continuous	I/E	Recorder
Hardness (mg/l)[8]	Weekly - Instream	NA	Grab

1 Weekly sampling shall occur on the same day of each week, unless the Permittee can document that sampling could not be performed due to extreme conditions. In such cases, a detailed explanation of the reason sampling could not be performed shall be prepared and kept with the analytical results for that day.
2 For Outfall 001, mine drainage from adit (prior to treatment), treated mine drainage, and final 001 discharge shall be monitored for the parameters labled "I/E" in this column. The Permittee shall collect influent and effluent samples on the same day.
3 The Permittee shall conduct analysis for total recoverable and dissolved metals.
4 Mercury shall be analyzed as total.
5 Chronic toxic units (See Definitions).

[6] The Permitte shall monitor the number of pH excursions outside the range of 6.5 to 8.5 Standard Units.
[7] The Permitte shall monitor the final effluent flows at 001 and 002, and treated mine drainage flow at 001.
[8] The Permittee shall sample the receiving water hardness downstream of the discharge.
[9] If the discharge concentration falls below the MDL, the Permittee shall report the effluent concentration as "less than {numerical method detection level}" on the DMR. Actual analytical results shall be reported on the DMR when the results are greater than the MDL. For averaging, samples below the MDL shall be assumed equal to zero. The Permittee shall report the number of non-detects for the month in the "Comment Section" of the DMR.

TABLE VII-7. Monitoring Requirements for Outfall 003

EFFLUENT PARAMETERS	MONITORING REQUIREMENT	
	Sampling Frequency	Sample Type
BOD_5 (mg/l)	Weekly	Grab
Total Suspended Solids (mg/l)	Weekly	Grab
Fecal Coliform (No./100 ml)	Weekly	Grab
pH (s.u.)	Weekly	Grab
Flow (gpd)	Daily	Estimate or Measure

B. Stormwater Monitoring

The permit requires monitoring of stormwater discharges from the borrow area (Outfall 004) and from each of the culverts along the access road (Outfall 005). The nature of the exposed materials indicate the stormwater discharges should not adversely affect water quality. This assumes appropriate design and implementation of BMPs. Quarterly monitoring of total suspended solids, oil and grease, and pH, along with periodic inspections, are required to evaluate the effectiveness of BMPs and to provide sufficient information to determine if these discharges either cause or contribute to water quality standards violations in Sherman Creek. To best assess the quality of the discharges, the Permittee shall be required to perform the sampling within 20 minutes of commencement of discharge.

Stormwater effluent limitations have not been incorporated into the draft permit, however, if a significant source(s) is identified, EPA may reopen the permit to include specific effluent limitations, additional monitoring requirements, and/or specific additions to the BMP Plan to reduce the pollutant discharge(s).

TABLE VII-8. Monitoring Requirements for Outfalls 004 and 005

EFFLUENT PARAMETERS	MONITORING REQUIREMENT	
	Sampling Frequency	Sample Type
Total Suspended Solids, (mg/l)	Quarterly	Grab
Oil and Grease, (mg/l)	Quarterly	Grab
pH, (s.u.)	Quarterly	Grab

C. Analytical Detection Levels

The following table presents the required Detection Levels and Minimum Levels for metals analyses for Outfalls 001 and 002. Adherence to this list will ensure consistency over the period of analysis.

TABLE VII-9. Detection Levels, and Minimum Levels		
Parameter	Method Detection Level	Minimum Level
Arsenic (μg/l)	1	3
Cadmium (μg/l)	0.1	0.3
Chromium (μg/l)	0.07	0.22
Copper (μg/l)	0.03	0.10
Lead (μg/l)	0.08	0.25
Mercury (μg/l)	0.2	0.5
Nickel (μg/l)	0.2	0.6
Selenium (μg/l)	2	6
Silver (μg/l)	0.05	0.16
Zinc (μg/l)	0.2	0.6

D. Ambient Monitoring

The draft permit requires the permittee to conduct ambient monitoring at selected locations within and around the Project. Monitoring of benthic organisms, resident fish populations and tissues, and anadromous fish will occur within Sherman Creek and Sweeny Creek. Sediment and water column monitoring will occur within upper and lower Sherman Creek, and Unnamed Creek below Outfall 002.

Water Column Monitoring

The permit includes requirements for monthly water column monitoring at selected locations. The monitoring will provide data to assess the physical characteristics of the receiving stream below the discharges. Water column monitoring will consist of analyzing samples for dissolved oxygen (DO), temperature, turbidity, color, and each of the parameters in Table VII-10. The monitoring results shall be included in a report and submitted along with the DMR for the month in which samples are taken. Water column monitoring shall be performed in Sherman Creek above and below Outfall 001, at existing monitoring stations 109 and 105, respectively, and the Unnamed Creek below the DTF discharge.

TABLE VII-10. Water Column Monitoring	
Parameter	Monitoring Frequency
Arsenic (μg/l)	Monthly
Cadmium (μg/l)	Monthly
Chromium (μg/l)	Monthly
Copper (μg/l)	Monthly
Iron (μg/l)	Monthly
Lead (μg/l)	Monthly
Manganese (μg/l)	Monthly
Mercury (μg/l)	Monthly
Nickel (μg/l)	Monthly
Selenium (μg/l)	Monthly
Zinc (μg/l)	Monthly
Nitrate (μg/l)	Monthly
Ammonia, Total (mg/l)	Monthly
Total Dissolved Solids (mg/l)	Monthly
pH (s.u.)	Monthly
Hardness (mg/l)[1]	Monthly
Flow (MGD)	Monthly

[1] As required to establish hardness-based water quality standards, hardness will also be monitored weekly at instream locations below the discharges from Outfalls 001 and 002.

Sediment Monitoring

The permit requires annual sediment monitoring and biological testing to assess the effect of mine discharges on sediments within the receiving streams. The deposition of contaminants within stream sediments can result in the sediments being toxic to aquatic life and wildlife. Sampling will be required at one location within Sherman Creek below the contributing outfalls (001, 004, and 005) and below the fish barrier. Baseline sampling and analysis shall occur prior to commencement of discharges from Outfalls 001, 004, and 005 and prior to commencement of tailings disposal at the DTF. Annual monitoring shall occur thereafter. A summary report shall be submitted to EPA by December 31st of each year. The report shall include relevant quality assurance/quality control data.

Previous studies and numerous site visits have indicated that sediment is often sparse, if present at all, within many of the receiving streams; therefore, the Permittee will be allowed some flexibility in the selection of suitable sampling locations. Although the exact location is not identified in the permit, sediment sampling locations shall be located below the fish barrier and in areas where deposition is likely to occur. The Permittee shall collect enough sediment from each location to conduct all of the chemical and biological tests identified in this document. Sediments samples will consist of the upper two centimeters of sediment and the minimum depth of the sampler penetration shall be four centimeters.

The following parameters specified in Table VII-11 shall be monitored for at each location using the listed analytical protocol (or equivalent) for each sediment sample.

TABLE VII-11. Sediment Monitoring Parameters and Analytical Methods

PARAMETER	PREPARATION METHOD	ANALYSIS METHOD	SEDIMENT MDL[1]
Arsenic	PSEP[2]	GFAA[3]	2.5
Cadmium	PSEP[2]	GFAA[3]	0.3
Copper	PSEP[2]	ICP[4]	15.0
Lead	PSEP[2]	ICP[4]	0.5
Mercury	7471[5]	7471[5]	0.02
Nickel	PSEP[2]	ICP[4]	2.5
Silver	PSEP[2]	GFAA[3]	0.2
Zinc	PSEP[2]	ICP[4]	15.0
Acute Toxicity	see below	See below	NA
Total Solids (%)	___	PSEP[6]; pg 17	0.1
Total Volatile Solids (%)	___	PSEP[6]; pg 20	0.1
Total Organic Carbon (%)	___	PSEP[6,7]; pg 23	0.1
Total Sulfides mg/kg	___	PSEP[6]; pg 32	1
Grain Size	___	Modified ASTM with Hydrometer	___

[1] Dry weight basis

[2] Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound, Puget Sound Estuary Program, EPA 910/9-86-157, as updated by Washington Department of ecology; Subsection: Metals in Puget Sound Water, Sediment, and Tissue Samples, Puget Sound Estuary Program.

[3] Graphite furnace Atomic Absorption (GFAA) Spectrometry - SW - 846, Test Methods for evaluating Solid Waste Physical/Chemical Methods, EPA 1986.

[4] Inductively Coupled Plasma (ICP) Emission Spectrometry - SW - 846, Test Methods for evaluating Solid Waste Physical/Chemical Methods, EPA 1986.

[5] Mercury Digestion and Cold Vapor Atomic Absorption (CVAA) Spectrometry - Method 7471, SW - 846, Test Methods for evaluating Solid Waste Physical/Chemical Methods, EPA 1986.

[6] Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound, Puget Sound Estuary Program, EPA 910/9-86-157, as updated by Washington Department of ecology; Subsection: Recommended Protocols for Measuring Conventional Sediment Variables in Puget Sound.

[7] Recommended Methods for Measuring TOC in Sediments, Kathryn Bragdon-Cook, Clarification Paper, Puget Sound Dredged Disposal Analysis Annual Review, May, 1993.

Acute Toxicity testing will also be required in the permit. Sediment samples will undergo Acute Toxicity testing to assess the relative toxicity of the sediment to representative aquatic life. The permits requires the following bioassays:

- Test Method 100.1: Hyalella azteca 10-d Survival Test for Sediments
- Test Method 100.2: Chirnomus tentans 10-d Survival Test for Sediments

Test methods, QA/QC, data recording, data analysis and calculations, and reporting shall be in accordance with Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates, EPA/600/R-94/024.

Both Hyalella azteca and Chirnomus tentans are representative species for their respective classes of aquatic life. The presence of either species has not been validated in the Project area; however, these species are commonly used as indicator species.

Biological Testing and Monitoring of Aquatic Resources

Monitoring of project effects on biological resources within streams includes measures of effects on both the organisms affected and their habitats.

Benthic Invertebrates

Benthic invertebrates shall be monitored using methods and locations established in baseline surveys in Sherman and Sweeny creeks. Sweeny Creek data will provide baseline data for benthic invertebrates. Two sample reaches in each creek shall be sampled as identified in Konopacky (1992). Each reach will be delineated for all possible sampling sites (those areas containing stream substrate with particles <20 cm along the long axis). Every third of fourth sampling site shall be sampled until a total of 6 samples is obtained (24 samples total from the 4 sampling reaches).

Samples shall be collected using a 0.093 m^2 Surber sampler equipped with a 300-micron mesh collection net. Collected samples will be placed in labeled plastic containers and preserved with 70 percent ethyl alcohol. Samples will be enumerated and identified to the generic level. Data will be reported for density per unit area and the Shannon Diversity and Evenness indices calculated for each sample.

Sampling shall be conducted once during the construction period and annually during the first 5 years of operation.

Resident Fish

Population Status

Abundance and condition of Dolly Varden char in Sherman Creek will be monitored using annual snorkel observations or electroshocking techniques similar to those employed in previous baseline studies conducted by Konopacky Environmental. Surveys will be conducted in lower, middle and upper Sherman Creek and Ophir Creek as identified in Konopacky (1996). These surveys will focus on fish greater than 25 mm. Data to be derived from these surveys includes: 1) population estimates by species, habitat type and stratum, and 2) condition factor by stratum.

Data will be collected so that statistical comparisons can be made with the previous baseline data. Estimates will be made of the variability of the data, including minimum detectable differences between samples as well as the precision of the 95 percent confidence interval. This information will be used to refine or revise sampling protocols during the construction and operations phase.

Tissue Analysis

The concentrations of arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium and silver in tissues of Dolly Varden char from the Sherman Creek drainage at sites used in the baseline survey by Konopacky (1996) shall be measured annually. Fish shall be collected in mid-July using non-destructive methods to avoid injuring fish not retained for analysis.

Each fish retained shall be measured for total length and weighed for wet weight prior to tissue preparation. The fish shall then be dried and re-weighed for a dry weight measurement. The fish sample shall be prepared following EPA Method 200.2, where 0.3 g of dry tissue and 5 ml of nitric acid are heated to 85°C for four hours, cooled, and dilute to a volume of 22 ml. Levels of the elements shall be determined by inductively-coupled plasma mass spectrometer (ICP-MS).

<u>Anadromous Fish</u>

Abundance of Spawning Salmon and Survival of Embryos

Annual surveys of spawning salmon in Sherman and Sweeny creeks shall be conducted every even-numbered year to assess the size of the escapement. Surveys shall consist of weekly stream counts through the spawning season documenting the distribution of salmon within the surveyed area.

Outmigrating juvenile pink salmon from Sherman and Sweeny creeks will be sampled the spring following each year of adult counts. Quantitative methods, such as a screw trap or inclined plane trap will be used to estimate the relationship between adult escapement and fry production.

Quality of Spawning Substrate

The quality of spawning substrate used by pink salmon shall be monitored to detect possible changes caused by potential introduction of fine sediments into lower Sherman Creek. Sediment samples from Sherman and Sweeny creeks shall be collected in July prior to spawning activity. Four replicate samples shall be collected from 2 locations using a McNeil-type sampler, using techniques and locations comparable to baseline studies reported by Konopacky (1992). The geometric mean particle size and fredle index will be calculated for all samples.

VIII. <u>Other Permit Conditions</u>

A. <u>Best Management Practices Plan</u>

The draft permit requires that Coeur develop a best management practices (BMP) plan to prevent the accidental discharge of pollutants to waters of the United States. The Permittee must submit the plan to EPA for approval within six months of the effective date of the permit. The plan will incorporate elements of pollution prevention as set forth in the Pollution Prevention Act of 1990 (U.S.C. 13101) and is intended to achieve the following objectives: minimizing the quantity of pollutants discharged from the facility, reducing the toxicity of discharges to the extent practicable, preventing the entry of pollutants into waste streams, and minimizing stormwater contamination. Coeur is required to develop specific BMPs to prevent ammonia and nitrates from blasting operations from affecting mine drainage. These BMPs will include procedures for controlling spills during storage, transfer or loading activities; spill containment and clean-up procedures; and measures to ensure complete detonation of all explosives. In addition, the BMP Plan may provide for additional effluent monitoring for compounds that are stored on the property and exposed to rain or snow. Upon approval, the elements of the BMP Plan become enforceable permit conditions.

B. Unauthorized Discharges

In order to clarify Permittee responsibilities regarding the potential discharge of pollutants and/or waste streams not listed in the permit application, the permit expressly prohibits discharges of waste streams that are not part of the normal operation of the facility as disclosed in the permit application.

C. Representative Sampling

This requirement in the permit requires sampling whenever a bypass, spill, or non-routine discharge of pollutants occurs, if the discharge may reasonably expected to cause or contribute to a violation of an effluent limit set forth in the permit. This is in response to concerns that permit violations and/or water quality standards violations could result from bypasses, spills, or non-routine discharges during times when the effluent is not routinely monitored. This requirement directs the Permittee to conduct additional, targeted monitoring to quantify the effects of these occurrences on the final effluent discharge.

D. Compliance Upon Permit Issuance

All permit limits will apply on the effective date of the permit. EPA recognizes that Coeur may not be able to comply with all limits for the existing mine drainage prior to construction of the mine drainage treatment system. If immediate compliance is not achieved EPA will issue an Administrative Order establishing a schedule for compliance based on the timely construction of the treatment facility.

IV. Other Legal Requirements

A. Endangered Species Act

EPA has determined that the discharges authorized by this permit will not affect any threatened or endangered species. As discussed in the DEIS, FEIS, and SEIS, the U.S. Forest Service and EPA have concluded that there are no threatened or endangered species within or near the Project boundaries.

B. Certification

Since waters are involved in this permitting action, the provisions of Section 401 of the Act apply. In accordance with 40 CFR 124.10(c)(1), public notice of the draft permit has been provided to the of Alaska agencies having jurisdiction over fish, shellfish, and wildlife resources.

C. Coastal Zone Management Act (CZMA)

The state of Alaska will be reviewing this permit to determine consistency with the Coastal Zone Management Act.

D. Permit Term

The permit shall expire five years from the effective date.

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